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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,056	06/23/2004	Jari Sirvio	AWEK 2881	9131

7812 7590 12/05/2007

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
3617	
MAIL DATE	**DELIVERY MODE**
12/05/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/500,056
Filing Date: June 23, 2004
Appellant(s): SIRVIO ET AL.

John Smith-Hill
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 9/07/2007 appealing from the Office action mailed 4/17/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

CA 2,373,462	Tigges et al	11-2000
JP 09142391A	Oshima	6-1997

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 8-13 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tigges et al (CA 2,373,462) in view of Oshima (JP 09142391A).

Tigges et al discloses a watercraft having an aft region and first and second opposite sides (shown particularly in figure 2), and comprising a hull having a cargo deck (shown in figures 2 and 3); the cargo deck defines a cargo space for accommodating trucks and other wheeled cargo, as shown in figures 2 and 3. The hull also includes a main propulsion means 6, 6, located in the aft region of the watercraft, for propelling the watercraft in a forward direction.

Oshima discloses a ship including a hull with opposite sides and a main propulsion unit driving a main propeller 1. Oshima teaches different configurations for steering the watercraft including, as shown in figures 1-3, the use of a main fixed propeller and two rotatable steering propulsion units located in the aft region of the watercraft on the first and second sides of the main propulsion means 1. In view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time of the invention to

substitute for the propulsion/steering means in Tigges with an arrangement including a main propulsion means located in the aft region of the watercraft for propelling the watercraft in a forward direction and first and second steering propulsion devices located in the aft region of the watercraft on the first and second sides of the main propulsion means generally as taught by Oshima. The steering propulsion devices mounted on the watercraft of Tigges et al, per the teachings of Oshima, would of necessity be mounted below the cargo deck. While Oshima does not specify the shaft output of the steering units relative to the main propulsion unit, it is reasonable to expect the shaft output of the steering units to be less than that of the main propulsion unit judging from the relative size of the propellers (as shown in figures 1-4), and the intended function of the three different units. The amount of the difference in output power between the shaft output and the main propeller shaft output is deemed to have been an obvious matter of design choice to one having ordinary skill in the art of marine propulsion and steering at the time of the invention. The steering propulsion devices of Oshima include a propeller part that is stationarily located (when not in use) outside the hull of the watercraft, generally as in claim 9. It should be noted that when the propeller of the steering propulsion devices claimed is in use, none of the parts of the propeller are stationarily, as the whole propeller would be rotating.

The propulsion means in the above combination includes a propeller, as in claim 10.

The main propulsion means in the above combination would have the main propulsion means located substantially centrally between the opposite sides of the watercraft, generally as shown in figures 1 and 2, as in claim 11.

Although the figures in the disclosure of Oshima do not show a prime mover, it is obvious and conventional for propulsion units in watercraft to include a prime mover, as in claim 12 and the type of prime mover is deemed to have been an obvious matter of choice to one having ordinary skill in the art at the time of the invention.

The use of electric motors, diesel motors and gas turbines to drive ships is well known in the art.

Similarly, the provision of a maintenance space below the cargo space for maintaining the steering propulsion devices would have been an obvious matter of design choice to one having ordinary skill in the art at the time of the invention. Although the steering propellers could be maintained from the outside, such maintenance would require special personnel or equipment, while the use of access panels through the hull would be a desirable feature.

The method steps of claims 16 and 17 are encompassed in the above combination of references.

(10) Response to Argument

Appellant presents an analyses of the *KSR International Co. v. Teleflex, Inc.,* 550 U.S. (2007) Court decision and presents a "question to ask is what problem known in the field of endeavor, i.e., ship propulsion and steering, and addressed by the application under appeal, provides a reason for combining the disclosures of Oshima and Tigges et al to arrive at the subject matter of claim 8, i.e. what is the motivation for the

combination? or, what is the "articulated reasoning with some rational underpinning" in support of the rejection?", page 11, lines 18-24.

Appellant further adds, that "in order to justify a rejection of claim 8 under 35 USC 103 over Tigges et al in view of Oshima, the examiner must identify a reason why a person of ordinary skill in the art would take the main propulsion device of Oshima and apply it to the vessel of Tigges et al, page 11, lines 29-31.

With regard to the *KSR* decision, as noted by appellant, on page 12, lines 3-8 of the brief, the examiner did provided a motivation that one of ordinary skill in the art at the time of the invention would have considered having the disclosures of Tigges et al and Oshima. While the outboard steering units in the disclosure of Tigges et al are adequate for steering, the manner in which these units are mounted creates problems when used to propel the vessel under normal circumstances. The steering units of Tigges et al are mounted through a vertical shaft that transfers thrust produced by the propellers through a connection on the hull that permits the units to rotate about an axis that includes the vertical shaft. This arrangement obviously creates major stresses on the mounting components when the propulsion units are used at full power while cruising. The arrangement of Oshima, on the other hand, provides a conventional propulsion system, in the form of propulsion means 1, and the additional benefit of side-mounted steering units 3, 3. Such an arrangement provides the advantage of positive steering provided by the side-mounted propellers and conventional, high output propulsion provided by the main propulsion unit 1.

While Oshima stresses the advantage of "attaining a reduction of underwater noise, while particularly a high output can be generated in a propeller for propulsion", this does not limit the application of a system as disclosed by Oshima to ships requiring "low underwater noise". The advantage of having a high output, low maintenance propulsion system and more positive steering provided by rotatable steering propellers would provide the motivation to modify the propulsion-steering arrangement of Tigges et al with a propulsion-steering arrangement as taught by Oshima. The reduction in noise created by the propulsion units would be just another benefit.

Appellant argues that "it would not have been obvious in view Oshima to have provided the ship of Tigges et al with a main shaft-driven propeller without a separate rudder means, in accordance with the second line of reasoning discussed above. Since a main propulsion means without a separate rudder means functionally connected thereto would not improve steering of the vessel disclosed by Tigges et al, the motivation invoked by the examiner does not support modifying the vessel of Tigges et al based on the disclosure of Oshima.", page 13, lines 9-17. This argument is not understood. The combination of references, as presented in the rejection of the claims states that "it would have been obvious to one having ordinary skill in the art at the time of the invention to substitute for the propulsion /steering means in Tigges with an arrangement including a propulsion means located in the aft region of the watercraft in a forward direction and first and second steering propulsion devices located in the aft region of the watercraft on the first and second sides of the main propulsion mean, generally as taught by Oshima".

On pages 13, 14, in paragraph, "B", appellant argues that "Oshima does not provide any motivation for modifying the vessel of Tigges et al. Oshima does not contain a general teaching that a vessel should be provided with a main propulsion means located in the aft region of the vessel for propelling the vessel in a forward direction and first and second steering propulsion devices located in the aft region of the vessel to the first and second sides of the main propulsion means. On the contrary, Oshima is concerned with a very specific problem, namely excessive underwater noise in a vessel having a need for a quiet underwater environment, and the teaching of Oshima is directed to this problem. The record does not establish that the problem to be solved by the structure disclosed by Oshima, namely reducing underwater noise in an oceanic research ship that uses underwater acoustic equipment, arises in the RoRo or RoPax ship disclosed by Tigges et al."

The Abstract of the disclosure of Oshima states that the problem to be solved is "To use a turning propeller at steering time so as to attain noise reduction of underwater noise, while particularly a high output can be generated in a propeller for propulsion" (our emphasis).While it is true that Oshima is concerned with underwater noise, Oshima is also concerned with steerability and high output of the propulsion system. The arrangement disclosed in Oshima achieves the high maneuverability and high output propulsion, while maintaining low underwater noise. These features are not limited to scientific ships requiring low underwater noise. High out propulsion and highly maneuverable steering are features applicable to any ship. Further, the disclosure

provided by a reference is not limited to intended application of the invention, but rather to the broad applications of the same.

Regarding the Declaration of Mr. Karl Hamburg. Both declarations were carefully considered, but neither one of the declarations presents factual evidence that would make the application of a system as disclosed by Oshima untenable in a watercraft of the type disclosed by Tigges. In essence, Mr. Hamburg presents his opinion, as noted in paragraphs 13 of the first declaration and paragraph 14 of the second declaration. These opinions are substantially as presented by appellant in his Arguments.

In paragraph "D", page 15, appellant argues that "Claim 8 contains a specific limitation regarding the power of the steering propulsion devices relative to the main propulsion means.

Neither Tigges et al nor Oshima discloses the power relationship set forth in claim 8. As discussed above, the examiner has dismissed this relationship as a matter of obvious design choice, if not disclosed by Oshima. However, the drawings in Oshima are obviously highly schematic and should not be relied on as conveying information regarding relative sizes. Also, Oshima does not explicitly disclose any information regarding relative power output. Moreover, even if Oshima implies that the power of the rudder propellers is less than that of the main propeller, the record does not contain any articulated reasoning why that relationship, in a ship for oceanic research or cable laying, would be applicable to the RoRo or RoPax vessel of Tigges et al."

While it is true that Oshima does not specifically disclose the relative power output of the steering propellers and the main propeller, and while we admit that appellant is correct in noting that the drawings are schematic, the intended use of the different propellers gives an indication of their power to one having ordinary skill in the art. The main propeller 1 in Oshima is obviously intended as the main drive of the vessel. The Abstract even makes reference to the desire to get a "high output". The steering units located on the sides of the vessel are intended mainly for steering the vessel. Because of their location on the aft end of the vessel, the power needed to provide steering would have to be considerably less than that required to propel the vessel. Oshima's concern with high underwater noise implies that conventional rudder systems would require a high output from the main propulsion unit creating high levels of underwater noise. The smaller steering units, on the other hand, provide sufficient steering power with lower engine noise. This suggests that the power used by the steering units is much lower than that of the main propulsion unit. Although we have no information as to what proportion of power is provided by each of the power units in Oshima, it is the examiner's opinion, based on the above analysis, that the output required by the steering devices is less than that of the common shaft of the main propulsion unit and that the ratio of the output of the steering devices to that of the main propulsion unit is deemed to have been an obvious matter of design choice to one having ordinary skill in the art at the time of the invention, as noted in the Final Rejection.

Applicant argues with reference to claim 15, on page 16, paragraph "E" that "based on the present record, there is nothing to support the examiner's contention that it would

have been an obvious matter of design choice to provide a maintenance space as set forth in claim 15."

While, admittedly, the references do not specifically discloses the provision of a maintenance space below the cargo deck, the provision of such a maintenance space would have been a desirable feature to provide maintenance of the steering units without having to have special personnel to service the units. As noted by appellant, Heers (6,790,109), a reference of record, and related to the vessel disclosed by Tigges actually shows a space 16 below deck 15. While the space is not designated as a maintenance space, it is the examiner's opinion that the provision of a maintenance space below the deck would have been desirable and would have been an obvious matter of design choice to one skilled in the art at the time of the invention. The motivation would have been to facilitate maintenance of the steering propellers without having to dock the vessel or to use special procedures under water.

With regard to method claims 16 and 17, these claims merely implement the features of the previous claims. One step in claim 16 is to "continuously using the main propulsion means exclusively to propel the watercraft and not to apply steering forces to the watercraft." The arrangement in the combination of references would function in this manner. The main propulsion means can not provide steering forces. The next step in claim 16 is "applying steering propulsion forces to the watercraft at first and second locations in the aft region to the first and second sides respectively of the main propulsion means and by selectively varying the directions of the steering propulsion forces applied

to the watercraft at said first and second locations." Again, the arrangement in the combination of references operates in this manner.

Claim 17 includes the step of "also using the steering propulsion devices to propel the watercraft in the forward direction." Although it is not clear if Oshima operates in this manner, the propulsion unit 20 is disclosed as being independent from the steering units 3. To simply operate the steering units to propel the watercraft in a forward direction is encompassed in the disclosure of the arrangement.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Jesús D. Sotelo

Conferees:

Lesley Morris LDM

Samuel Morano

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An Agency of Industry Canada

Office de la Propri,t, Intellectuelle du Canada
Un organisme d'Industrie Canada

(11) CA 2 373 462 (13) A1

(40) 16.11.2000
(43) 16.11.2000

(12)

(21) 2 373 462

(22) 10.05.2000

(51) Int. Cl.[7]: B63H 23/24, B63B 1/04, B63H 1/12, B63H 5/16

(85) 13.11.2001

(86) PCT/DE00/01454

(87) WO00/68072

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199 28 961.1 DE 24.06.1999
PCT/DE99/01842 DE 24.06.1999
299 13 498.9 DE 03.08.1999
200 03 451.0 DE 26.02.2000
PCT/DE00/00537 DE 25.02.2000

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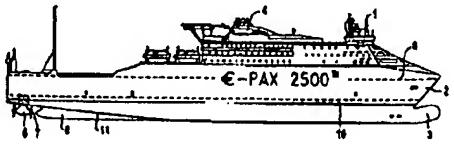
(54) BATEAU RAPIDE ALLANT EN MER ET A STABILITE DE ROUTE, A COQUE OPTIMISEE POUR UNE HELICE DE GOUVERNAIL

(54) COURSE-HOLDING, HIGH-SPEED, SEA-GOING VESSEL HAVING A HULL WHICH IS OPTIMIZED FOR A RUDDER PROPELLER

(57)

The invention relates to a course-stable, fast, seagoing ship comprising a hull that is optimized for a rudder propeller. The inventive ship has a hull designated for accommodating cargo or passengers and has at least one rotatable, preferably electric rudder propeller (POD) (6) which is arranged under the hull of the ship in a gondola-like manner and which comprises at least one motor generator unit for supplying power. Said motor generator unit is arranged in the hull of the ship, whereby the hull of the ship has, at least in part, a bottom (11) which slopes upward approximately to both sides of the hull. The front portion of the hull is designed to stabilize the course and movement of the ship and terminates underwater, in particular, with a relatively narrow bow (2) comprising a bulb (3). In addition, a flow guide body (skeg) (8) which is provided for optimizing the maneuverability characteristics as well as for optimizing the flow against the rudder propeller (6) is arranged in front of each rudder propeller. Said flow guide body has a volume of displacement for the water flowing against the respective rudder propeller.



Tigges et al

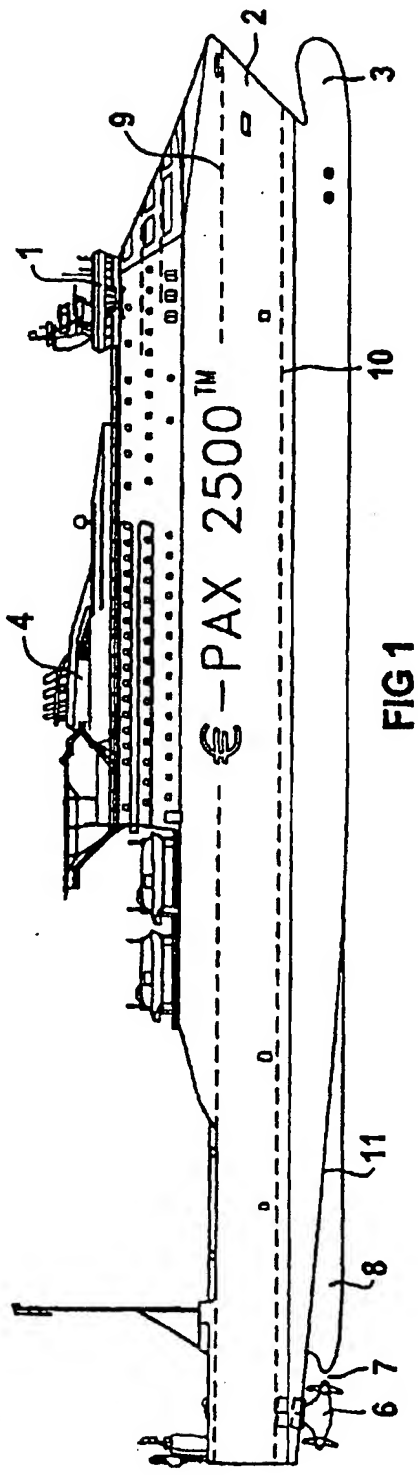


FIG 1

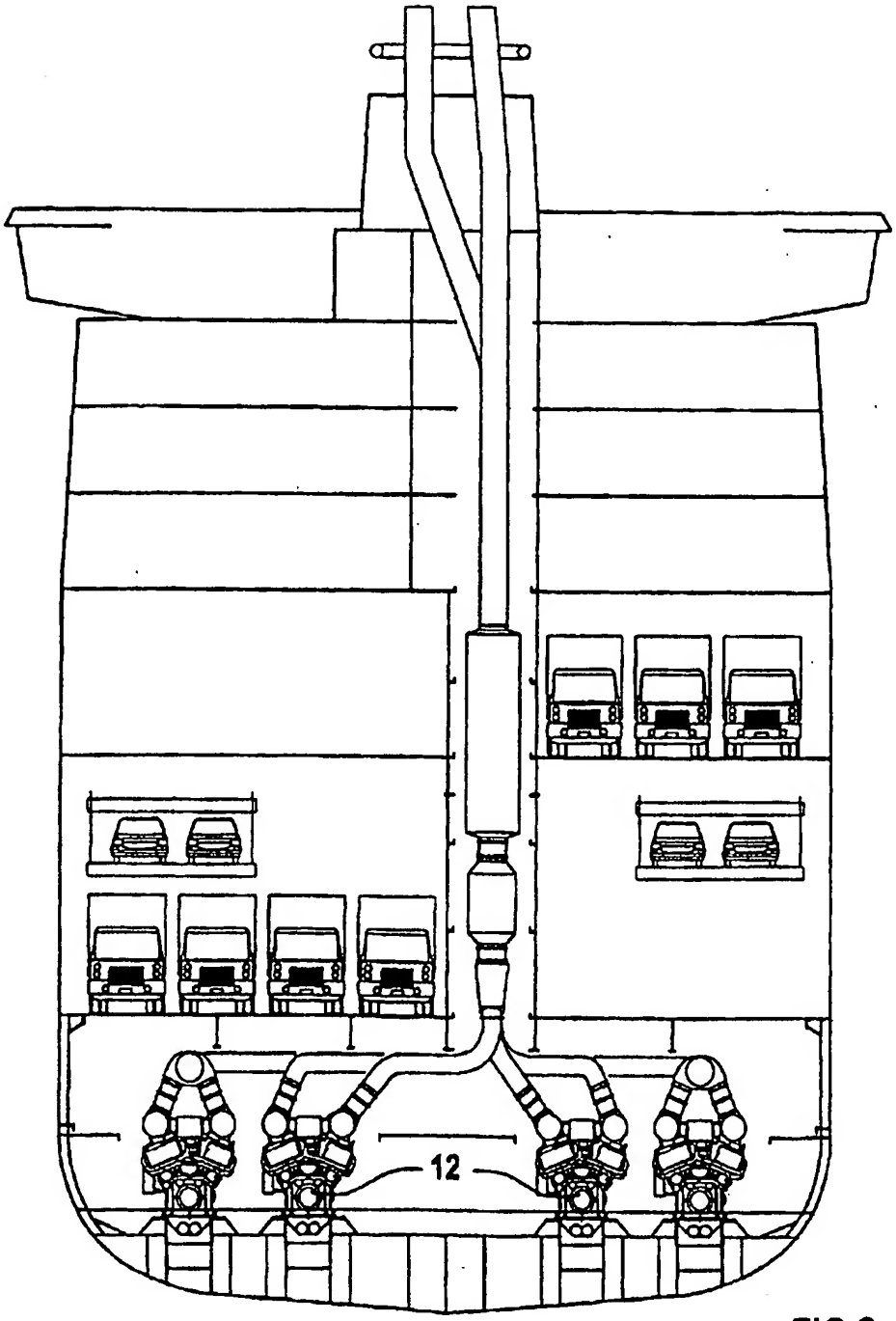


FIG 2

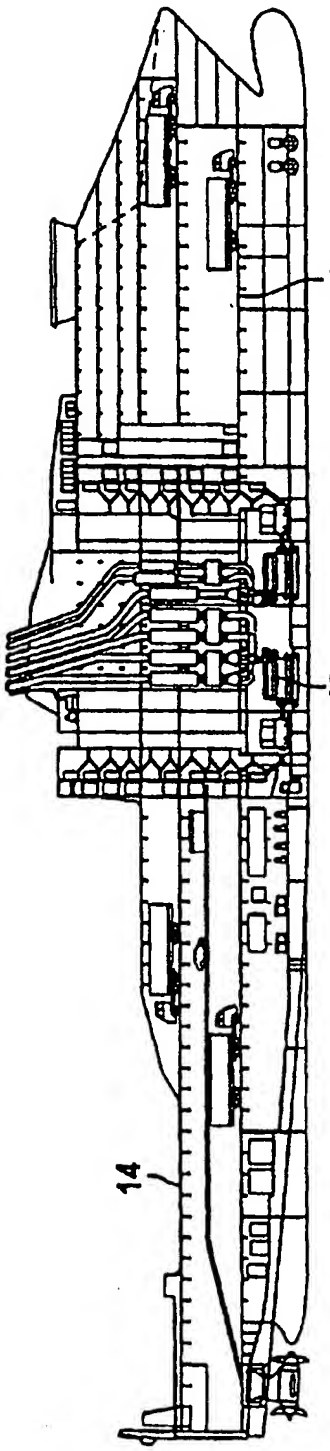


FIG 3

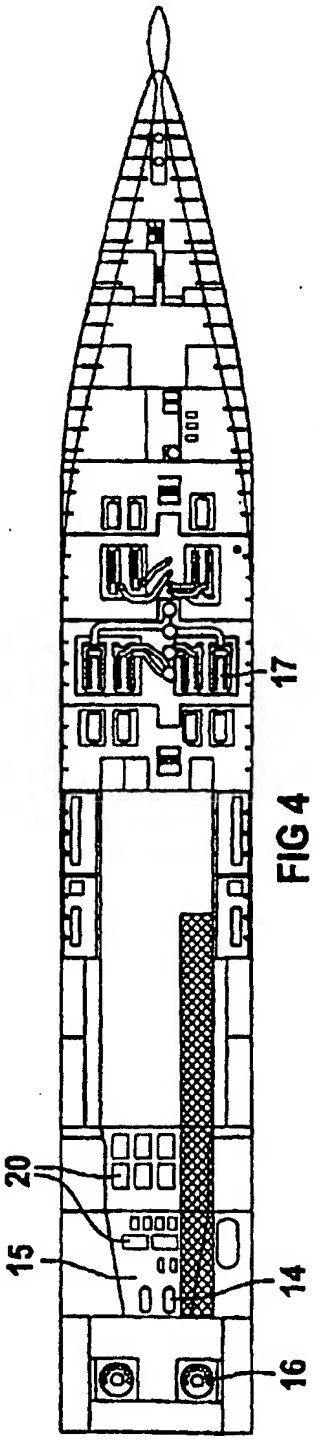


FIG 4

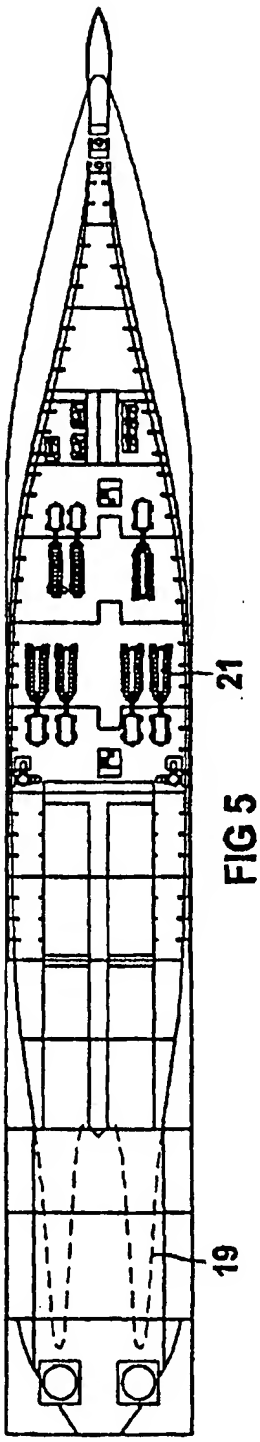


FIG 5

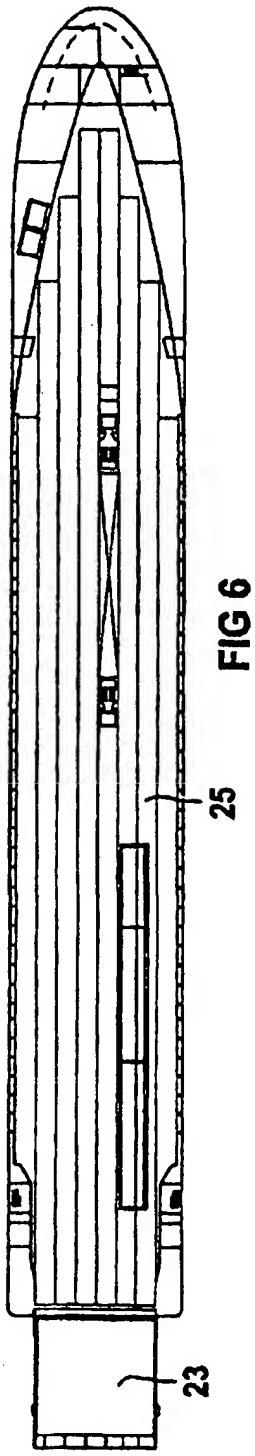


FIG 6

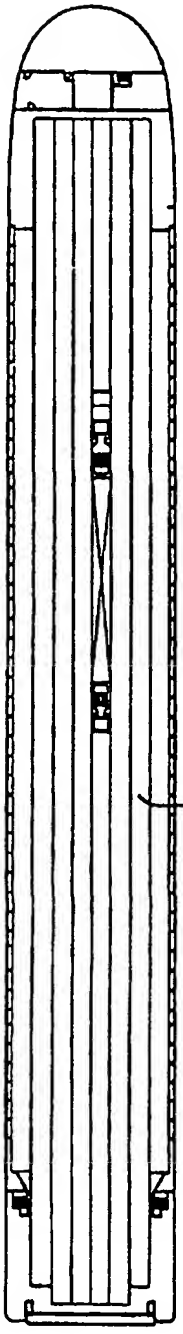


FIG 7

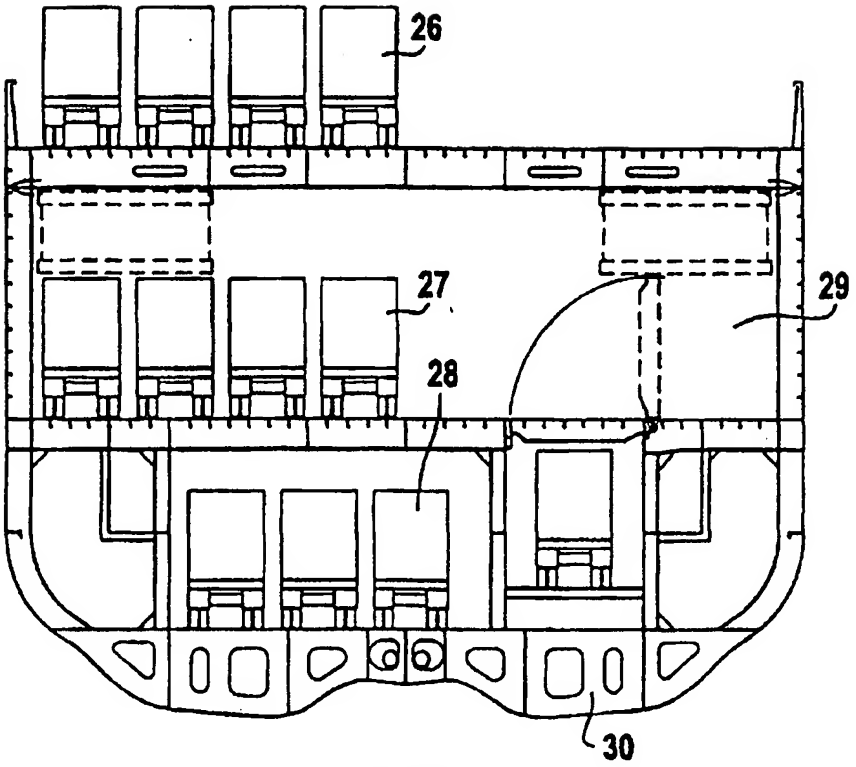


FIG 8

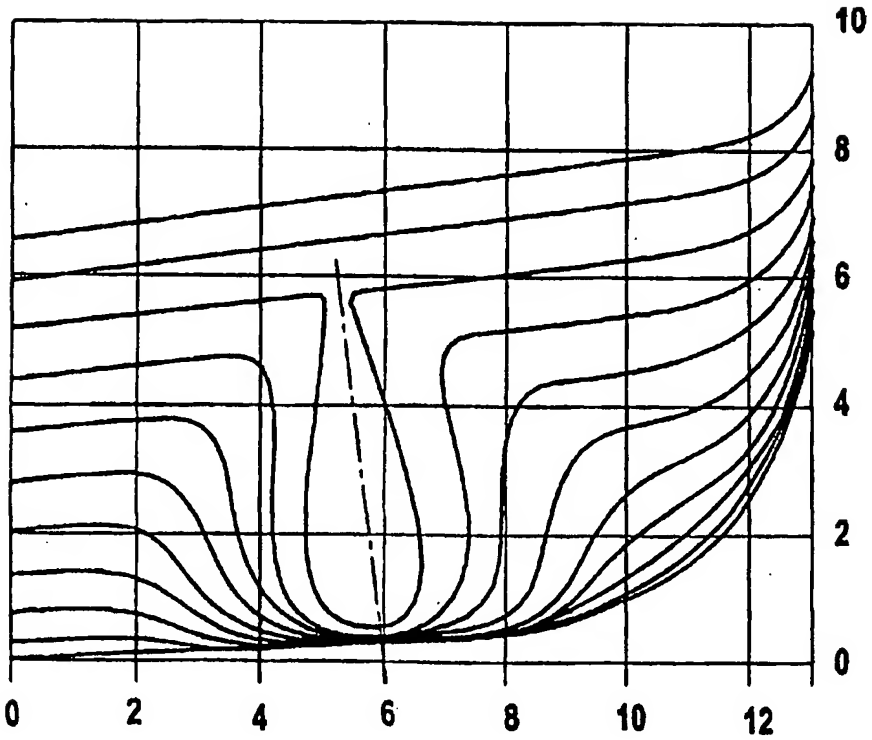


FIG 9

Abstract

Course-holding, high-speed, sea-going vessel having a hull which is optimized for a rudder propeller

A course-holding, high-speed, sea-going vessel having a hull which is intended to hold payloads or passengers and at least one rotatable, preferably electric, rudder propeller (POD) which is arranged gondola-like under the hull of the vessel and has, to supply it with power, at least one motor/generator unit which is arranged in the hull of the vessel, the hull of the vessel having at least in part a bottom which rises somewhat toward the two sides of the hull, and in that the front part of the hull is designed so as to stabilize the course and movement of the vessel and ending under water, in particular in a relatively slender bow with a bulb, and in that a flow-guiding element (skegg) is arranged upstream of each rudder propeller in order both to optimize the handling characteristics and to achieve an optimized flow against the rudder propeller, which has a displacement volume for the water flowing against the respective rudder propeller.

FIG 1

Description

Course-holding, high-speed, sea-going vessel having a hull which is optimized for a rudder propeller

The invention relates to a course-holding, high-speed, sea-going vessel having a hull which is intended to hold payloads or passengers and at least one rotatable, preferably electric, rudder propeller (Pod) which is arranged gondola-like under the hull of the vessel and has, to supply it with power, at least one motor/generator unit which is arranged in the hull of the vessel.

Vessels which correspond to the above are known, for example from the field of cruise liners. The known vessels are vessels with a keel structure in which the rudder and the shaft system have been replaced by one or more electric rudder propellers. The actual shape of the vessel is essentially unchanged. An example is presented in the publication "The SSP Propulsor" from Siemens and Schottel, No. 159U559 04982.

The object of the invention is to specify a new, high-speed, sea-going vessel which has, in contrast, an overall design which has been specifically optimized for the use of electric rudder propellers to make it possible, in particular, to exploit fully all the possible advantages in terms of the utilization of space, the handling characteristics, the resistance of the vessel and the efficiency of the propulsion of the vessel which can be obtained by using electric rudder propellers.

The object is achieved in that the hull of the vessel is designed so as to be adapted to the electric rudder propeller drive both optimized in terms of utilized space and also in terms of flow, for which purpose the hull of the vessel mainly has a bottom

which rises somewhat toward the two sides of the hull, and in that the front part of the hull is designed so as to stabilize the course and movement of the vessel and ends under water, in particular in a relatively slender bow with a bulb, and in that a flow-guiding element (skegg) is arranged upstream of each rudder propeller in order both to optimize the handling characteristics and to achieve an optimized flow against the rudder propeller, which has a displacement volume for the water flowing against the respective rudder propeller. This new design makes it advantageously possible both to configure the useful space in the hull in an optimized fashion and to obtain stable course-holding and sea-going characteristics with the smallest possible resistance of the vessel and optimized drive efficiency. In particular, an increase in useful space by significantly more than 10% and an increase in the efficiency of propulsion by several percent are achieved in this way. Thus, the customer - shipowner or charterer - is provided with an increased payload volume with reduced energy consumption when operating the vessel. There is also the option of traveling at a higher speed.

The introduction of the skegg which is essential to the invention increases the wetted surface of the body of the vessel. This known fact, which has previously discouraged experts in the field from using voluminous flow-guiding elements on the lower part of a sea-going vessel to a relatively large extent, is, however, surprisingly more than made up for by the advantages, such as the increase in the propulsion efficiency which is possible, and by the optimized low-resistance outgoing flow in the stern area of the vessel. Overall, the use of the skeggs according to the invention provide for the vessel such great advantages that they more than compensate for the disadvantage of the greater wetted surface. This applies in particular

to vessels which are driven by rudder propellers in a multiple arrangement.

The vessel according to the invention disproves the prejudices of experts in respect of the use of voluminous underwater flow-guiding elements for sea-going vessels, in particular if the overall design of the hull is optimized for the use of rotatable rudder propellers, and said rudder propellers are appropriately dimensioned and arranged. In this context, it is particularly advantageous to use low electric rudder propellers which permit particularly favorable skegg designs (small skegg surfaces) and whose shanks and motor housing can be included in the optimization of flow.

In a refinement of the invention there is a provision for the bow to be designed, in particular in the lower part, with, in part, a concave profile. As a result, it is very advantageously possible to select an, overall, relatively full shape for the forebody of the vessel without having to dispense with a course-holding effect of the bow.

In a further refinement of the invention there is provision that the flow-guiding elements (skeggs) are hook-shaped at the end in the longitudinal direction, preferably their design is matched to the specific type of vessel and they have an outgoing flow characteristic which gives rise to a decelerated flow against the housing of the rudder propellers largely free of separation. This results, inter alia, in the advantageous possible increase according to the invention in the efficiency of propulsion of the rudder propellers, the rudder propellers themselves being advantageously arranged and set, as a result of an angular position in respect of the rising stern in a vertical direction in respect of the bottom of the vessel and the longitudinal direction of the vessel, in such a way as to produce a further improvement in the resistance-optimized outgoing flow of the rear part of

the vessel and an increase in the propulsion efficiency (skeggs).

There is provision here that the flow-guiding elements (skeggs) are arranged bent toward the outside on the bottom of the vessel, the angle being between 3° and 10°, in particular approximately 7°. Together with a design of the flow-guiding elements which is droplet-shaped in cross section, a flow channel which is designed so as to widen in the upward direction, leading to a separation-free, decelerated flow against the rudder propellers, is obtained. At the same time, in general terms, a very good course-holding stability, which is advantageously maintained even when there are rolling movements, is obtained.

In a further refinement of the invention there is provision that the flow-guiding elements, the lower part of the hull and the bow are designed in terms of shape and length so as to bring about a low-resistance straight course of the vessel. Here, the flow-guiding elements form an integral part of the hull, the skegg parameters being as follows: on average the skegg width is in the range 0.1 to 0.06 of the width of the vessel, in particular approximately 0.08 of the width of the vessel, the skegg depth is approximately in the range 1.0 to 0.74 of the draft of the vessel, in particular approximately 0.92 of the draft of the vessel, and has an offset with respect to the center of the vessel approximately equal to the distance between the respective propeller shaft and the center of the vessel. The skegg length is advantageously between 0.25 and 0.38 of the length of the water line at the designed draft, in particular approximately 0.32 of the length of the water line at the designed draft. A skegg is advantageously arranged in front of each rudder propeller.

It is particularly advantageous that the skeggs are designed as front vanes for the rudder propellers if they approximately comply with the conditions

specified above. Thus, the rudder effect is amplified at small angles of the rudder propeller, and the vessel reliably follows the rudder angles with the stern, without significantly drifting in a lateral direction.

In a further refinement of the invention there is provision that each rudder propeller has preferably two individual propellers, in particular unidirectional propellers, and that the propellers are arranged in a directional overall outgoing flow of the rear of the vessel, which leads to a decelerated oncoming flow in the vicinity of the rudder propellers. This results advantageously in a high level of efficiency of propulsion by virtue of the combination of rudder propeller and shape of the vessel.

In a further refinement of the invention there is provision that by virtue of an arrangement of diesel (gas-turbine) generator units behind the bow area the hull is designed so as to run in a particularly directionally stable fashion and, apart from the bulb at the bow with its partially concave transition into the shape of the front of the vessel and the skeggs, does not have any flow-guiding elements. This results in a good course-holding characteristic of the vessel with a low-resistance flow around the vessel with a simultaneously optimized outgoing flow at the stern.

In a further refinement of the invention there is provision that the rudder propellers are arranged on shanks which act as flow-guiding elements, are in particular short, and have housings for the propeller shaft which act as flow-guiding elements. This results both in an optimized design of the useful space in the vessel and also in good maneuverability.

There is further provision that the shanks and housings of the rudder propellers are shaped in such a way that, together with the flow-guiding elements on the hull and the stern shape, they produce an end of the hull which is optimized in terms of outgoing flow and has low resistance. This optimization, which is

achieved on the basis of towing tank trials, makes the advantages of a vessel hull which is optimized for drive by rudder propellers particularly striking. In total, an increased level of propulsion efficiency together with reduced vessel resistance are obtained.

There is provision that the abovementioned optimizations are used in particular for hulls which are designed for speeds of between 20 and 36 knots. At such high speeds of a vessel, the previously unattained course-holding stability in conjunction with the high level of propulsion efficiency and the low vessel resistance, in particular, are advantageous.

The design according to the invention of a high-speed, sea-going vessel is of particular advantage if it is designed as a Roro or Ropax vessel, the rudder propellers being designed as low rudder propellers and being arranged underneath the main car deck in such a way that the main car deck can be designed so as to extend from the stern to the bow. This results in a specific optimization of the useful space for Roro or Ropax vessels. The advantages achieved are of course also obtained for container vessels or passenger vessels.

The drives from the Siemens/Schottel Consortium mentioned in the brochure mentioned at the beginning can be configured as low rudder propellers without major changes because they have a particularly low hull/shank junction. Together with a slip ring arrangement within the upper part of the shank and rotary motors directly at the upper edge of the shank, or else in the upper part of the shank, this results in such a low overall height of the drive that the stern of the vessel can be designed so as to be virtually free of the influence of the drive on the inside. The auxiliary units for the rudder propeller, such as the hydraulic pumps, are arranged here essentially next to the hull/shank junction so that a low bearing level for entry ramps for vehicles etc. can be installed in the

stern area. The main car deck can be arranged directly above the rotary bearing of the low rudder propeller and an access to the shank of the rudder propeller can then be provided through a shank cover.

In one refinement of the vessel, there is advantageously provision here that it has at least two motor/generator units for the drive which are arranged on the bottom of the vessel. This ensures good stability of the vessel with an optimized car deck arrangement. The space for the motor/generator units with the associated control and switching devices is arranged in the hull and bounded by bulkheads in such a way that the SOLAS and IMO stability requirements and the Stockholm Convention for sea-going vessels are complied with. This results, according to the invention, not only in a sea-going vessel which is optimized in terms of space and consumption but also which is particularly safe.

The invention is explained in more detail with reference to drawings, it being possible to infer further advantageous details which are essential to the invention both from said drawings and from the subclaims.

In particular:

FIG 1 shows the side view of a Ropax vessel which is designed in accordance with the invention,

FIG 2 shows a cross section at the level of the machine room through a vessel corresponding to FIG 1,

FIG 3 shows a longitudinal section with a view of the interior of the vessel and of the hull shape of the vessel through a vessel corresponding to FIG 1,

FIG 4 shows a section at the level of the second deck through a vessel corresponding to FIG 1,

FIG 5 shows a section at the level of the first deck through a vessel corresponding to FIG 1,

FIG 6 shows the car deck with the loading ramp of a different but similar vessel constructed in accordance with the invention,

FIG 7 shows the weather deck of a different but similar vessel which is constructed in accordance with the invention,

FIG 8 shows a partial section through the afterbody of a different but similar vessel in accordance with the invention with integral skeggs, and

FIG 9 shows the linear outline of such vessels in the skegg area.

In FIG 1, 1 designates the bridge of the vessel, 2 designates the bow and 3 the bow bulb. The weather deck 9, which can thus extend from the aft to the fore part of the vessel, extends into the bow 2. At a suitable distance behind the bridge 1 there is the funnel structure 4 with the exhaust pipes, whose arrangement can be selected relatively independently of the current position of the diesel or gas turbine generator units. Like the weather deck 9, the main freight deck, for example a main car deck 10, is designed so as to extend from the stern to the bow so that these decks have a storage area extending from the stern to the bow of the vessel. The short rudder propeller 6, which according to the invention is advantageously embodied here as a double rudder propeller, is responsible for the fact that the main car deck 10 is continuous even in the stern area. This results in particularly small propeller diameters accompanied by a good degree of efficiency. A skegg 8, which, as shown, ends in a hook shape at a distance 7 in front of the rudder propeller 6, is arranged in each case in front of the rudder propeller 6. The distance 7 is essential for a vibration-free flow against the rudder propeller 6, it is therefore as a rule 1% of the length of the vessel. 2 to 3% of the length of the vessel are also advantageous. The underwater part 11 of the vessel is designed so as to rise slowly in the

stern area so that a largely eddy-free, low-resistance efflux is produced in the stern area. Overall, with the type of vessel according to the invention, the shape of the bow and of the stern, the size and arrangement of the rudder propellers and the skeggs are very advantageously matched to one another in such a way that the vessel moves with good course-holding characteristics and at low resistance accompanied by a high level of propulsion efficiency of the drive.

In FIG 2, 12 designates diesel generator units with off-center exhaust-gas ducting. This produces lorry loading tracks which can be configured in an optimum way.

FIGS 3, 4 and 5 show machine rooms with indicated diesel units 13, 17 and 21 at the bottom center/front part of the vessel. As is apparent, the small diesel or gas turbine units can be distributed in such a way that a continuous main car deck is produced. The precise installation location is selected, for example in the center area of the vessel, in such a way that favorable longitudinal mechanical stresses (smooth water moment, transverse force profile) for the vessel are obtained.

In FIG 3, 18 designates the main car deck and 14 the weather deck. In FIG 4, 20 designates converters and transformers and 14 designates hydraulic units in the stern. The hydraulic units in the stern are advantageously arranged in a hydraulic room 15 approximately at the level of the upper edge of the rudder propellers 16. These units therefore lie below the continuous main car deck.

In FIG 5, 19 finally designates the skeggs, which are directed rearward at this level and which form an integral component of the underside of the hull.

An advantageous design of the deck is shown in FIG 7 (weather deck) and FIG 6 (main car deck). In FIGS 6 and 7, the parking aisles for the motor

vehicles, containers, etc. are designated by 24 and 25. The entry ramp for the vehicles is designated by 23. As is apparent, the design according to the invention provides a larger number of parking spaces for vehicles or containers than has ever been achieved before.

FIG 8 shows a cross section through the vessel in the area where the skeggs start. Here, the lorries on the weather deck are designated by 26. The lorries on the main car deck are designated by 27 and the lorries in the lower part of the vessel by 28. To carry passenger cars, side deck tracks 29 which can be raised and which can be driven onto from the main deck are provided here. The front parts 30 of the skeggs are integrated into the double bottom and its steel frame and stringer system. The skeggs therefore form integral parts of the structure of the vessel.

Finally, FIG 9 serves to explain the skegg parameters, the skegg parameters being selected in particular as a function of the type of vessel. The skegg parameters are similarly varied, depending on whether the vessel is a pure Roro vessel, in which only a relatively low level of traveling comfort is required, a Ropax ferry, a container or a passenger vessel. The distance between the rudder propeller and the rear edge of the skegg is also selected according to these criteria because these are decisive for the smooth running of the rudder propellers. The greater the distance, the lower the transmission of vibration by pressure pulses from the rudder propellers is to the hull.

The pressure pulses from the propellers of the rudder propellers to the respective shank and hull of the vessel are, on the other hand, advantageously influenced by technical control measures.

Patent claims

1. A course-holding, high-speed, sea-going vessel having a hull which is intended to hold payloads or passengers and at least one rotatable, preferably electric, rudder propeller (POD) which is arranged gondola-like under the hull of the vessel and has, to supply it with power, at least one motor/generator unit which is arranged in the hull of the vessel, characterized in that the hull of the vessel mainly has a bottom which rises over a small angle toward the two sides of the hull, and in that the front part of the hull is designed so as to stabilize the course and movement of the vessel and ends under water, in a long stretched-out bow with a bulb, and in that it has two rudder propellers, a flow-guiding element (skegg) being arranged upstream of each rudder propeller in order both to optimize the handling characteristics and to achieve an optimized flow against the rudder propeller, which has a displacement volume for the water flowing against the respective rudder propeller.

2. The vessel as claimed in claim 1, characterized in that the lower part of the bow following the bulb is designed with a concave profile.

3. The vessel as claimed in claim 1 or 2, characterized in that the flow-guiding elements (skeggs) are hook-shaped at the end in the longitudinal direction, their design is matched to the specific type of vessel and they have an outgoing flow characteristic which, with a flow bearing against the skegg, gives rise to a decelerated flow against the rudder propeller unit.

4. The vessel as claimed in claim 1, 2 or 3, characterized in that the flow-guiding elements (skeggs) are arranged bent toward the outside on the

bottom of the vessel, the angle being between 3° and 10°.

5. The vessel as claimed in claim 1, 2, 3 or 4, characterized in that the rudder propellers are arranged inclined toward the outside, approximately perpendicular with respect to the bottom of the vessel which rises by a small angle to the two sides of the vessel, for example inclined by 4° to 5°.

6. The vessel as claimed in claim 1, 2, 3, 4 or 5, characterized in that the zero position of the rudder propeller is selected so as to deviate from the longitudinal direction of the vessel in such a way that a flow channel which widens is produced between the rudder propellers.

7. The vessel as claimed in claim 1, 2, 3, 4, 5 or 6, characterized in that the axes of rotation of the rudder propellers are aligned so as to rise toward the stern.

8. The vessel as claimed in claim 1, 2, 3, 4, 5, 6 or 7, characterized in that the flow-guiding elements (skeggs), the lower part of the hull and the bow are designed in terms of shape and length so as to bring about a straight course of the vessel when the flow bears against it.

9. The vessel as claimed in claim 1, 2, 3, 4, 5, 6, 7 or 8, characterized in that the flow-guiding elements (skeggs) form an integral part of the hull, the dimensioning parameters being as follows:

- skegg width in the range 0.1 to 0.06 of the width of the vessel
- skegg depth in the range 1.0 to 0.74 of the draft of the vessel
- offset of the center of the skegg with respect to the center of the vessel equal to the distance between the associated propeller shaft and the center of the vessel

- length of the skegg in the range 0.38 to 0.25 of the length of the water line at the designed draft, for example approximately 0.30 to 0.35 of the length of the water line at the designed draft.

10. The vessel as claimed in one or more of the preceding claims, characterized in that the skeggs are designed as front vanes for the respective rudder propeller so that the effectiveness of small rudder angles is amplified.

11. The vessel as claimed in one or more of the preceding claims, characterized in that each rudder propeller has two individual propellers, in particular unidirectional propellers.

12. The vessel as claimed in one or more of the preceding claims, characterized in that the propellers are arranged in a directional overall outgoing flow of the rear of the vessel, which outgoing flow is decelerated in the vicinity of the rudder propellers and is oriented by the skeggs to produce low-loss flow against the rudder propellers.

13. The vessel as claimed in one or more of the preceding claims, characterized in that the hull is designed such that it runs with a good straight course by virtue of an arrangement of diesel/gas-turbine generator units behind the bow area and has a horizontal trim.

14. The vessel as claimed in claim 13, characterized in that the drive units are arranged in the center area of the vessel or in front of the center area of the vessel, for example under the deck-house area in Ropax ferries, in order to obtain small mechanical stresses for the vessel (smooth water moment, transverse-force profile).

15. The vessel as claimed in claim 13 or 14, characterized in that the shanks and housings of the

rudder propellers are shaped and arranged in such a way that, together with the flow-guiding elements (skeggs) on the hull and the stern shape, they produce an end of the hull of the vessel, the shape of which allows water to run off without eddying.

16. The vessel as claimed in claim 13, 14 or 15, characterized in that, apart from the bulb at the bow with its, if appropriate, partially concave transition into the shape of the front of the vessel and the skeggs, it does not have any flow-guiding elements.

17. The vessel as claimed in one or more of the preceding claims, characterized in that the hull is designed for speeds of between 20 and 36 knots.

18. The vessel as claimed in one or more of the preceding claims, characterized in that it is designed as a Roro or Ropax vessel, the rudder propellers being designed as low rudder propellers and being arranged underneath the main car deck in such a way that the main car deck can be driven onto from behind and can be designed so as to extend from the stern to the bow.

19. The vessel as claimed in one or more of the preceding claims, preferably as claimed in claim 13 or 14, characterized in that it has at least two motor/generator units for the drive, said motor/generator units being distributed according to stability specifications and being arranged on the bottom of the vessel and emitting their exhaust gases centrally.

20. The vessel as claimed in one or more of the preceding claims, characterized in that the space for the motor/generator units with the associated control and switching devices is arranged and bounded by bulkheads in the vessel in such a way that the SOLAS and IMO stability requirements and, with regard to safety, the Stockholm Convention for sea-going vessels are complied with.

21. The vessel as claimed in one or more of claims 1 to 17 and 19, 20, characterized in that it is embodied as a container vessel.

22. The vessel as claimed in one or more of claims 1 to 17 and 19, 20, characterized in that it is embodied as a cruise liner.

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CA 02373462 2001-11-13

Application number/ Numéro de demande : 1800-01454

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